

NOTE ON SOME RECENT WORK ON THE ROCKS  
OF SAMOA.

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I have recently received from Professor M. Weber, of Munich, an exhaustive report on the petrography of the Samoan Islands, worked out from a collection of rocks made by Herr J. Friedländer in 1907.\* The report is, to me, of extreme interest, since it casts further light on two problems already discussed in my papers.

In my chemical note on a recently erupted hyalopilitic basalt from Savaii † my analysis showed a higher soda-content than might have been expected from the petrological description. I explained that this was probably due to the existence of an alkaline matrix in the glassy base, and to a high alkali-content in the greenish-brown augite. Professor Weber has examined a specimen of the same lava and has also found the felspar to be *bytowntite*. He has not analysed this specimen, but in his other analyses of older Savaiian lavas he finds, as I did, that their titanium-contents are remarkably high; and he also finds that many of them approach, both mineralogically and chemically, to the alkaline division of igneous rocks. My own researches were confined to those specimens which I collected near the active volcano, and near Apia in Upolo; hence I failed to discover any rocks of a distinctly *alkaline facies*. The rocks described by Professor Weber include felspar-basalts, palagonite-tuff, phonolite, nepheline-basanite; and, from the island of Tutuila, which I did not visit, he describes alkali-trachyte, and phonolitic trachyte as well.

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\* Weber, M., "Zur Petrographie der Samoa-Inseln," Abh. d. ii. Kl. K. Bay. Akad. d. Wiss. zu München. xxiv. 287, 1909.

† These Proceedings, 1907, p. 706.

From the island of Aunuu he describes trachydolerites and palagonite-tuff. This is a very welcome addition to our knowledge of alkaline rocks, and fully confirms my surmise that there must have been an alkaline base in the basalt which I analysed.

The second point which I wish to touch on is, that the subalkaline composition now established by Weber for the Samoan lavas, casts some doubt on my hypothesis that the eruptions along the Samoa-Tonga-Taupo-line depend upon an earthfolding movement. In my paper on "The Distribution, Origin, and Relationships of Alkaline Rocks" \* I emphasised the point that alkaline and subalkaline (mixed) magmas are erupted mainly in regions where great movements along fault-planes of the normal type are in progress, and not in regions of compression (an adaptation of Prior's view). Whether, therefore, the subalkaline magmas of Savaii are the result of further block-faulting in the Pacific, or of a minor fold-movement subsequent upon the break-up of the Fijian continent, or to the magmatic differentiation of normal calcic magmas connected with a more extensive fold-movement, is a problem that must be left in abeyance.

Dr. Weber also draws attention to the fact that mixed magmas are becoming recognised in far more localities than formerly supposed. In the Pacific area they have been reported from the Sandwich Islands, the Caroline Islands, Dunedin district in New Zealand, the Island of New Pomerania of the Solomons, and other islands, as well as from Samoa. Dr. Weber remarks that it becomes increasingly difficult to draw a sharp line of demarcation between alkaline and alkali-calcic rocks, and that our interpretation of a petrological province will vary according to geological time. Those are matters to which I, too, have drawn attention in my thesis on the subject. I offered an explanation of the origin of mixed magmas which, as yet, I see no reason to alter. With regard to geological time, it appears that those petrographical provinces which are almost wholly pure alkaline

most frequently are of Eocene age. Those which are very mixed sometimes antedate, and sometimes follow this geological period.

With regard to volcanic succession, I am of the opinion that in Samoa essentially the same order obtains as in the Eastern Australian alkaline province, namely, the most alkaline rocks antedate the more normal felspar-olivine basalts. The volcanic succession so commonly observed in Australian alkaline areas is, however, not universal. It does not hold for the Vesuvian area, nor for the Dunedin area. In mixed provinces, indeed, there is seldom any regularity of succession, and this fact goes far to justify the genetic distinction between alkaline and calcic magmas.

Dr. Weber's work renders it still clearer that to refer to alkaline rocks as the Atlantic type, and to calcic rocks as the Pacific type is an unfortunate system of nomenclature; and I feel strengthened in my view that the former constitute a rift-valley (katepeiric) type, whereas the latter constitute a type accompanying mountain-folding, geanticline-formation, and overthrust (anepeiric).